

What is claimed is:

[Claim 1] 1. A progressive decoding method for decoding a bit-stream signal into an image data, the bit-stream signal having a plurality of scans, the progressive decoding method comprising:

receiving the scans according to a predetermined sequence;
decoding each of the scans into a partial decoded pixel and a non-zero indicator, wherein the non-zero indicator represents whether or not an encoding coefficient of the current decoded scan corresponds to a non-zero value; and
summing the partial decoded pixel generated from each of the scans according to the predetermined sequence, and updating a non-zero history with the non-zero indicator.

[Claim 2] 2. The progressive decoding method of claim 1 wherein when all of the scans are processed, a plurality of integral decoded pixels are generated from summing partial decoded pixels generated from the scans, and the integral decoded pixels form the image data.

[Claim 3] 3. The progressive decoding method of claim 1 wherein the bit-stream signal is a progressive JPEG bit-stream signal, and the image data is a JPEG image data.

[Claim 4] 4. The progressive decoding method of claim 1 further comprising:

down-sampling the partial decoded pixel generated from each of the scans for generating a partial down-sampling decoded pixel; and

summing up the partial down-sampled decoded pixel generated from each of the scans and according to the predetermined sequence, and updating a non-zero history with the non-zero indicator,.

[Claim 5] 5. A progressive decoding method for decoding a bit-stream signal into an image data, the bit-stream signal comprising a plurality of scans, the image data being generated after all of the scans are processed with the progressive decoding method, the progressive decoding method comprising:

- (a) receiving a scan;
- (b) determining whether the scan is the first scan of the scans; if it is, progressing to step (c); if it is not, progressing to step (d);
- (c) decoding the scan into a partial decoded pixel and a non-zero history;
- (d) decoding the scan into a partial decoded pixel and a non-zero indicator, wherein the non-zero indicator represents whether or not an encoding coefficient of the current decoded scan corresponds to a non-zero value; progressing to step (e);
- (e) summing up the partial decoded pixel and a previously summed partial decoded pixel and updating the non-zero history with the non-zero indicator.

[Claim 6] 6. The progressive decoding method of claim 5 further comprising:

- (f) determining whether the scan is the last scan of the scans after steps (c) or (e), and if it is, stopping performing the progressive decoding method.

[Claim 7] 7. The progressive decoding method of claim 5 being performed by a progressive decoder having a memory device, wherein the progressive decoding method further comprises:

- (g) before step (e), retrieving the previously summed partial decoded pixel and the previously generated non-zero history from the memory device; and

(h) after step (e), storing the newly summed partial decoded pixel and the newly updated non-zero history into the storage device.

[Claim 8] 8. The progressive decoding method of claim 7 wherein the decoder further comprises a processing unit electrically coupled to the storage device, and the processing unit is used for receiving the scans of the bit-stream signal, performing the progressive decoding method, and outputting the image data.

[Claim 9] 9. The progressive decoding method of claim 5 wherein when all of the scans are processed, a plurality of integral decoded pixels are generated from summing partial decoded pixels generated from the scans, and the integral decoded pixels form the image data.

[Claim 10] 10. The progressive decoding method of claim 5 wherein the bit-stream signal is a progressive JPEG bit-stream signal, and the image data is a JPEG image data.

[Claim 11] 11. A progressive decoding method for decoding a bit-stream signal into an image data, the bit-stream signal having a plurality of scans, the image data being generated after each of the scans is processed by the progressive decoding method, the progressive decoding method comprising:

- (a) receiving a scan;
- (b) determining whether the scan is the first scan of the scans; if it is, progressing to step (c); if it is not, progressing to step (e);
- (c) decoding the scan into a partial decoded pixel and a non-zero history;
- (d) after step (c), down-sampling the partial pixel for generating a partial down-sampled decoded pixel;
- (e) decoding the scan into a partial decoded pixel and a non-zero indicator, wherein the non-zero indicator represents whether or not an encoding coefficient of the current decoded scan corresponds to a non-zero value;

(f) after step (e), down-sampling the partial decoded pixel for generating a partial down-sampled decoded pixel; and
(g) after step (f), summing up the partial decoded pixel and a previously summed partial down-sampled decoded pixel, and updating the non-zero history with the previously generated non-zero indicator.

[Claim 12] 12. The progressive decoding method of claim 11 further comprising:

(h) determining whether the scan is the last scan of the scans after steps (d) and (g), and if it is, stopping performing the progressive decoding method.

[Claim 13] 13. The progressive decoding method of claim 11 being performed by a progressive decoder having a storage device, wherein the progressive decoding method further comprises:

(i) before step (g), retrieving the previously summed partial down-sampled decoded pixel and the previously updated non-zero history from the storage device; and

(j) after step (g), storing the newly summed partial down-sampled decoded pixel and the newly updated non-zero history into the storage device.

[Claim 14] 14. The progressive decoding method of claim 13 wherein the decoder further comprises a processing unit electrically coupled to the storage device, and the processing unit is used for receiving the scans of the bit-stream signal, for performing the progressive decoding method, and for outputting the image data.

[Claim 15] 15. The progressive decoding method of claim 13 wherein the decoder further comprises a filtering device for performing step (c) and step (f).

[Claim 16] 16. The progressive decoding method of claim 11 wherein when all of the scans are processed, a plurality of integral decoded pixels are generated from summing partial decoded pixels generated from the scans, and the integral decoded pixels form the image data.

[Claim 17] 17. The progressive decoding method of claim 11 wherein the bit-stream signal is a progressive JPEG bit-stream signal, and the image data is a JPEG image data.

[Claim 18] 18. A progressive decoder for decoding a bit-stream signal into an image data, the bit-stream signal having a plurality of scans, the progressive decoder comprising:

a processing unit for receiving the scans in a predetermined sequence, decoding each of the scans into a partial decoded pixel and a non-zero indicator according to the predetermined sequence, summing the partial decoded pixels generated from each of the scans according to the predetermined sequence, updating a non-zero history with the non-zero indicator each time a scan being decoded, and outputting the image data, wherein the non-zero indicator represents whether or not an encoding coefficient of the current decoded scan corresponds to a non-zero value; a storage device for storing a summed partial decoded pixel and the non-zero history; and

a memory management unit electrically coupled to the storage device and the processing unit for controlling the storage device.

[Claim 19] 19. The progressive decoder of claim 18 further comprising a filtering device in the processing unit for down-sampling the partial decoded pixel generated from each of the scans to generate a corresponding partial down-sampled decoded pixel.

[Claim 20] 20. The progressive decoder of claim 18 further comprising a display unit electrically coupled to the memory management unit for displaying the image data.